Water Resources

With 60,000 miles of rivers and streams, highlighted by the Hudson River; the ports of San Juan and the New York/New Jersey Harbor; its bays and estuaries; Lake Ontario, Niagara Falls and the St. Lawrence Seaway; the Caribbean Sea; Long Island Sound and the ocean waters of the Jersey Shore, Long Island, Puerto Rico and the Virgin Islands—Region 2 is a land of water (Figure 6). Its water resources are central to the Region's character, its beauty, its economy and the health of its people.

The Region's Water Resources

	New Jersey	New York	Puerto Rico	Virgin Islands	**Region 2 Total**
Total River and Stream Miles	6,450	52,337	5,385	na[i]	**64,172**
Total Lake Acres	24,000	790,782[ii]	10,887	na[iii]	**825,669**
Ocean Shore Miles	120	120	550	173	**963**

[i] The Virgin Islands report no perennial streams on any of the islands.
[ii] Excludes Great Lakes Area.
[iii] There are no large freshwater lakes or ponds on any of the islands.

Source: U.S. EPA National Water Quality Inventory 1996 Report to Congress.

Figure 6

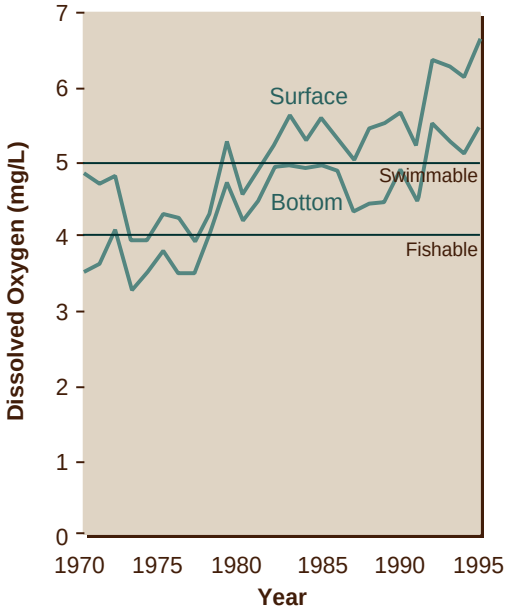
Since the passage of the federal Clean Water Act in 1972, EPA and the states have made significant progress reducing pollution discharges into the Region's waters. These strides have been mainly the result of controls on municipal and industrial wastewater discharges, which are now effectively regulated by a national permitting system. In New Jersey, for example, discharges from municipal and industrial sources, referred to as "point sources," were reduced by 49 percent between 1985 and 1994. It is estimated that in 1972, approximately 2,000 miles of New York's rivers and streams were impaired by municipal wastewater pollution. Today, efforts to control wastewater discharges have reduced that figure to 700 miles.

One measure of improvement attributable to better wastewater treatment is dissolved oxygen levels, which reflect the ability of the water to support aquatic life. Reducing organic pollution from sewage treatment plants has increased dissolved oxygen in many of the Region's surface waters, a factor that has contributed to healthier ecosystems. In the New York/New Jersey Harbor, for example, dissolved oxygen levels have steadily increased since 1970. By 1992, oxygen levels in most portions of New York/New Jersey Harbor met water quality standards for both swimming and fishing (Figure 7).

As point sources of water pollution have diminished, EPA has increased its focus on non-point sources. Non-point water pollution stems from a variety of diffuse sources, including urban and agricultural runoff and the deposit of airborne pollutants to water. Some of the pollutants entering our waters from non-point sources include: fertilizers and pesticides; oil, grease, and salt from roadways; sediment from improperly-managed construction sites, crop land, forest lands, and eroding streambeds; bacteria and nutrients from livestock, pet wastes, and faulty septic systems; and sulfur dioxide and mercury from air deposition. While the impact of an individual non-point source may be small, the cumulative impact from numerous sources can significantly degrade water quality. Effective control of non-point source pollution requires changes in land use practices and personal behavior.

A Measure of Water Quality

Average Summer Dissolved Oxygen in New York/New Jersey Harbor



Source: 1995 New York Harbor Water Quality Survey Appendices.

Figure 7

Under the Clean Water Act, EPA works with its state and local partners to develop non-point source assessments and then identify and implement control programs. In New York, for example, EPA has funded non-point source education and information programs addressing stormwater runoff from new housing developments. Puerto Rico is also implementing several non-point source programs to reduce runoff from housing developments and dairy operations.

Another threat to water quality comes from disturbing the natural balance of hydrologic systems. Such disturbances range from dredging harbors, to damming running water for electricity generation and flood control, to removing streamside wetlands. All of these activities can impact water quality and aquatic habitat by raising water temperatures; stimulating oxygen depletion; disrupting the food supply, migration, and life-cycle of aquatic species; increasing the intensity and energy of runoff; and contributing to flooding and accelerating erosion. For more information on wetlands status and trends, see the *Land Use and Ecosystem Health* chapter.

The Status of Region 2 Waters

Aquatic Species as Stream Quality Indicators

One of the best ways to measure water quality is by evaluating the diversity and abundance of aquatic macroinvertebrate (insect) populations. Since many such species are sensitive to various forms of pollution, over time these organisms often tell us much more about water quality than can be determined by chemical monitoring.

New Jersey monitors macroinvertebrate populations in streams located in each of the state's five major drainage basins. Monitoring conducted between 1992 and 1996 shows that 35 percent of the areas sampled are not impaired, 53 percent are moderately impaired, and 12 percent are severely impaired (Figure 8). Most of New Jersey's monitoring stations have only been sampled once, precluding trend analysis.

New York has conducted extensive macroinvertebrate monitoring since 1972. Of the sites monitored between 1972 and 1992, 38 percent improved, 4 percent declined, and 58 percent showed no change in water quality. The most recent monitoring data, collected between 1987 and 1996, shows that 40 percent of those waters monitored are

Ecological Condition of New Jersey and New York Streams

Source: New Jersey Department of Environmental Protection.

Source: New York State Department of Environmental Conservation.

Figure 8

not impacted. Forty-two percent are impacted slightly, 16 percent moderately, and 2 percent severely (Figure 8).

It is important to note that much of the sampling is targeted at suspected problem areas and that these numbers are not necessarily representative of all flowing waters in New Jersey and New York.

Contaminated Sediments

While toxics entering the Region's waters have decreased in recent years, some remain in the sediment layers lining the bottom of streams, rivers, lakes and estuaries. These sediment layers provide habitat and food for many aquatic species fulfilling important roles in the food chain. When bottom feeding fish or other aquatic species consume organisms with elevated levels of toxics, the contaminants can accumulate in the predators' tissue; a process known as bioaccumulation. Bioaccumulation ultimately poses threats to those species, including humans, that occupy the higher niches of the food chain.

A 1997 EPA study, which included sediment sampling at 1,096 stations throughout Region 2, found substantial sediment contamination in many parts of New York and New Jersey. Sampling sites were classified into three tiers according to their potential for adverse effects on aquatic life and human health (Tier 1 sites represent those with the highest levels of contaminants). Throughout the Region, 32 percent of the sites rank as Tier 1 and are considered to cause probable adverse effects (Figure 9). On a Regional basis, the most common chemical contaminants are copper, lead, nickel, PCBs, mercury, cadmium, zinc, DDT, and arsenic.

Based on this study, EPA has identified 12 watersheds, encompassing portions of New York and New Jersey, as areas of probable concern (APCs) for sediment contamination (Figure 10). These are areas where bottom dwelling organisms and fish may come in frequent contact with contaminated sediments. EPA plans to conduct additional studies to determine the effects of sediment contamination and opportunities for reducing possible risk. These designations do not imply that all portions of these watersheds have contaminated sediments.

The presence of contaminated sentiments and other chemical pollution can lead to high concentrations of contaminants in fish tissue. Due to the dangers associated with consumption of contaminated fish, Region 2 has, since 1994, granted over $200,000 to New York and New Jersey to conduct public outreach and education programs on fish advisories that urge populations at risk (sustenance anglers and women and children) to limit or avoid eating fish from certain waters. These efforts have primarily focused on the Hudson River, Lake Erie, and the New York/ New Jersey Harbor, areas affected by PCB contamination.

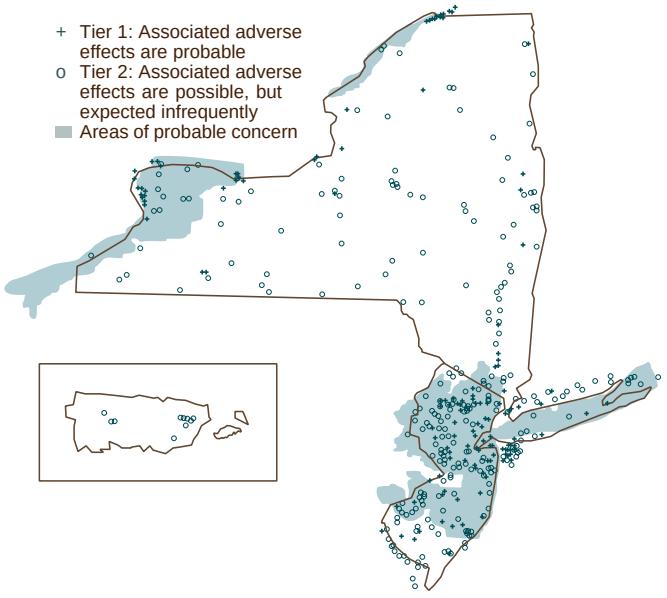
Sediment Sampling

	Percentage of Monitoring Stations			
	Probable Associated Adverse Effects (Tier 1)	Possible Infrequent Adverse Effects (Tier 2)	No Indication of Associated Adverse Effects (Tier 3)	Number of Monitoring Stations
New Jersey	32%	51%	17%	448
New York	34%	50%	16%	618
Puerto Rico	17%	70%	13%	30
Regional Total	**32%**	**51%**	**17%**	**1,096**

Source: EPA 1998, The Incidence and Severity of Sediment Contamination in Surface Waters of the United States Vol. 1: National Sediment Quality Survey.

Figure 9

Sediment Contamination by Watershed



Source: EPA 1998, The Incidence and Severity of Sediment Contamination in Surface Waters of the United States Vol. 1: National Sediment Quality Survey.

Figure 10

Cleaning Up the Niagara River

Famous for its spectacular waterfalls at the border of the United States and Canada, the Niagara River flows for 37 miles from Lake Erie to Lake Ontario. Along the way, the river provides drinking water, recreational opportunities, and hydropower electricity. Over time, this important resource has received significant quantities of pollution from both point and non-point sources. Of particular concern are high levels of toxics — including mercury, polychlorinated biphenyls (PCBs), and pesticides — many of which accumulate in the food chain, threatening the ecological health of the river ecosystem and those who consume its fish and wildlife.

In 1987, alarmed by the river's high levels of toxic chemicals, Canadian and U.S. government agencies committed to reduce toxic inputs to the river by developing the Niagara River Toxics Management Plan. The plan targeted eighteen priority toxic chemicals and called for 50 percent loadings reductions of ten of these substances by 1996. Some of the actions taken to reduce toxic loading of the river include reducing both non-point and point source toxics discharges; cleaning up nearby hazardous waste sites contributing contaminated ground water and runoff to the river; and diverting contaminated ground water to a sewage treatment plant.

An intensive monitoring program involving sampling at the head and mouth of the river, as well as measuring concentrations of toxics in the river's fish and mussel species, shows that the plan is yielding significant results. Between 1986 and 1996, the levels of many of the priority toxics found at the river's head and mouth have dropped by over 50 percent. In addition, toxics found in fish and mussels have been drastically reduced. To ensure that these encouraging trends continue in the future, the U.S. and Canada reaffirmed their commitment to the plan in 1996.

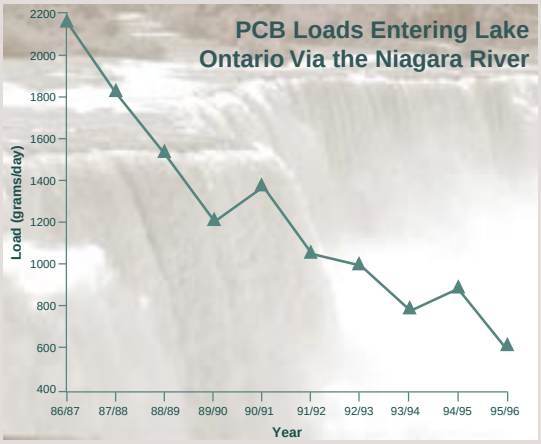


Photo: State of New York

Source: Niagara River Toxics Management Plan.

Estuaries and Coastal Waters

Estuaries: Supporting Recreation, Commerce and Habitats

Estuaries are partially enclosed water bodies where rivers meet the sea. These tidally-influenced ecosystems provide habitats that support thousands of aquatic and terrestrial animal and plant species, sustain commercial fisheries, and provide water filtration and flood control. States and territories classify estuarine and other water bodies by whether or not they support designated uses. Such designated uses include fish consumption, swimming, and shellfish harvesting. In 1996, 25 percent of New Jersey's and 28 percent of New York's surveyed estuarine waters were classified as impaired — meaning that these waters only partially support or fail to support their designated use.

In 1997, 14 percent of New York's 1.1 million acres of classified shellfish growing waters were designated as "harvest-limited." This category includes areas designated as suitable for harvesting only under certain conditions, as well as those where harvesting is prohibited due to high levels of pollution caused by sewage discharges, organic wastes, proximity to known sources of pollution or particular weather conditions. Of New Jersey's 737,000 acres of classified shellfish growing waters, 29 percent were listed as "harvest-limited" in 1997.

Due in part to public concern about water quality in coastal areas, in 1986, the National Oceanic and Atmospheric Administration (NOAA) began monitoring levels of trace metals and organic compounds in mussels and oysters at coastal sites throughout the U.S. The "Mussel Watch" project monitors 18 offshore locations throughout Region 2. Each regional site sampled for the trace metal cadmium and the organic compounds DDT and chlordane—including locations in Long Island Sound, Moriches Bay, the Hudson/Raritan Estuary, the New York Bight, and Delaware Bay—shows decreasing concentrations over time.

In addition to monitoring chemical pollution, EPA, working with its state and local partners under the National Estuary Program (NEP), has completed comprehensive conservation management plans for three Region 2 estuaries—Long Island Sound, the New York/New Jersey Harbor, and the Delaware River. The Region is developing plans for the Peconic Bay, Barnegat Bay and San Juan Bay. All six estuaries are currently threatened by pollution, development and overuse. Activities under the NEP include decreasing toxic pollution through pollution prevention programs, constructing artificial wetlands, managing storm water and non-point runoff, improving land use planning and management, and monitoring and controlling vessel discharges.

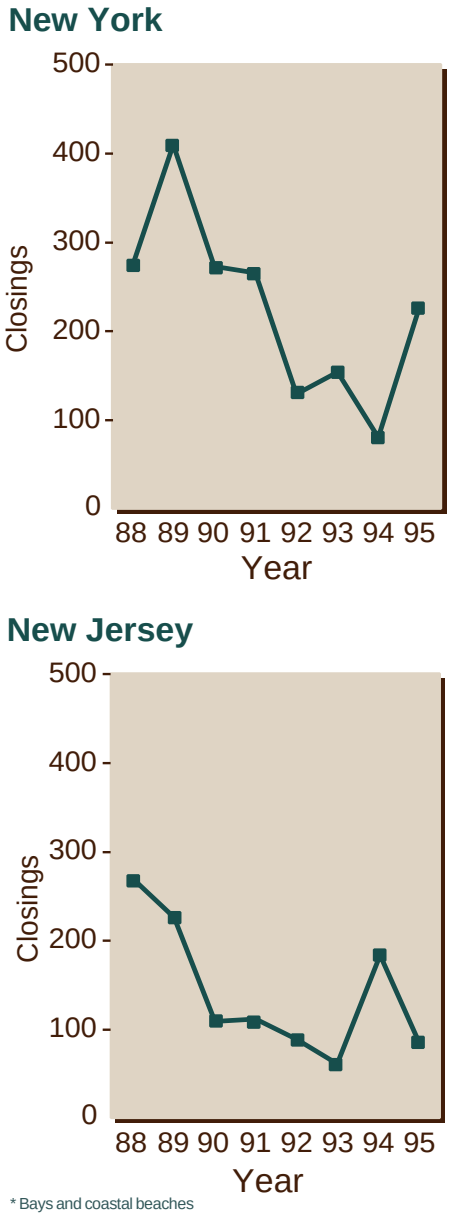
Coastal Waters: Fewer Beach Closings, Better Water Quality

The number of beach closings due to unhealthy water conditions, although not a perfect indicator because of variations in monitoring among states, represents one measure of coastal water quality. Historically, New Jersey and New York beaches faced threats posed by bacterial contamination from overflows from sewers that carry both storm water and municipal wastewater during rainstorms and discharges of untreated wastewater due to malfunctioning sewage treatment plants. Scientists also believe that natural processes, such as changes in ocean water patterns and climate, may exacerbate bacterial contamination of coastal waters. Figure 11 shows New York and New Jersey beach closings for bays and coastal beaches attributable to bacteria from 1988 to 1995.

While Puerto Rico does not have beach closure procedures, the Commonwealth began monitoring bacteria levels at its beaches in 1997, and plans to adopt beach closure regulations in the near future. According to Puerto Rico's 1996 water quality report to Congress, 33 of its 550 surveyed shore miles were unsuitable for swimming as a result of pollution from storm water runoff, industrial discharges and contaminated water seeping from landfills.

Trash floating in coastal waters and bays or washed up on beaches can also cause beach closings. Most floating trash results from improper waste disposal and storage. During the summers of 1987 and 1988, floating trash such as wood, plastic, paper and medical waste washed up on New Jersey beaches and Long Island's south shore. Public perception of the danger posed by medical waste on area beaches resulted in an estimated loss of over 2 billion in tourism dollars. In response, EPA developed new guidelines for medical waste disposal, and federal, state and local agencies created the Floatables Action Plan to reduce floating trash and debris through enhanced surveillance and regular cleanups of coastal waterways. During the late spring and summer, EPA conducts water sampling at key locations and makes daily helicopter inspection flights over the New York/New Jersey Harbor and the New Jersey shoreline. Region 2 also initiated its "Clean Streets/Clean Beaches" campaign, which helps to prevent street litter from washing into area waterways by discouraging littering. These enhanced control measures, along with heightened public awareness, have reduced the amount of floating trash washing up on area beaches. New Jersey has reported no beach closings due to floating trash since the early 1990s, and New York has reported only one.

Beach Closings* in New York and New Jersey Due to Bacteria



* Bays and coastal beaches

Source: New York Department of Health; New Jersey Department of Environmental Protection.

Figure 11

Ocean Disposal: Keeping the Ocean Environmentally and Economically Sound

As early as the late 1800s, Congress, recognizing the threats posed to ocean waters by offshore waste disposal, gave the U.S. Army Corps of Engineers authority to regulate it. Since 1972, EPA has been responsible for designating ocean disposal sites. Until ocean disposal of garbage was prohibited in 1934, New York City dumped much of it garbage in the New York Bight, the area extending approximately 100 miles offshore from the New York/New Jersey Harbor. Disposal of industrial by-products and sewage sludge was phased out by 1994 and the sites were closed. Sediments dredged from the Harbor continued to be disposed of in a portion of the Bight known as the Mud Dump Site until September 1997 when the site was closed and redesignated, along with surrounding areas used historically for sediment disposal, as the Historical Area Remediation Site (HARS). This action ended the gridlock that had effectively stopped the dredging of the NY/NJ Harbor, presenting a serious threat to the region's economy. Suitable sediments dredged from the Harbor will be placed in the HARS to mitigate contamination from past disposal activities.

Puerto Rico's Bioluminescent Bays

Very high concentrations of light-emitting planktonic organisms give certain ocean waters the appearance of glowing after dark (bioluminescence) when their surfaces are disturbed. Puerto Rico has three of only five bioluminescent bays in the world. Bahia Mosquito, the territory's most well known bioluminescent bay, is located 10 miles off Puerto Rico's coast on Vieques Island. Bioluminescent bays are typically small in size, relatively shallow in depth, with a narrow opening to the sea to prevent flushing of ocean waters into the bay. The bays also depend on the presence of mangroves along their shores, which provide nutrients essential for the plankton.

Unfortunately, the Puerto Rico bays face a number of serious environmental threats. Increased development around the bays has resulted in increased erosion and pollution. Other threats to these sensitive ecosystems include boating, mangrove destruction, domestic pollution and the deepening of canals to improve access for vessels.

A number of grassroots organizations as well as the Vieques Conservation and Historical Trust are working to preserve Puerto Rico's bioluminescent waters.

S.C. Delaney/EPA

Drinking Water Quality

Sixty-two percent of the Region receives drinking water from surface water sources such as lakes, reservoirs, rivers and rain catchments, with the remaining 38 percent served by ground water. The vast majority of the Region—over 29 million people—receive water from one of more than 3,800 community water systems. These systems are required to meet maximum contaminant levels (MCLs) for more than 80 contaminants. MCLs are based on known or anticipated adverse human health effects, the ability of various technologies to remove the contaminant, the effectiveness and cost of treatment. The chart below shows populations served by community water systems that violated one or more MCLs from 1993 to 1996. In New Jersey, New York and Puerto Rico, the number of people affected by MCL violations has decreased over time. The most significant reduction was in New York from 1995 to 1996, due to the absence of violations for the New York City water supply (Figure 12).

Despite these overall improvements, certain areas, especially in the Caribbean, continue to face drinking water quality and quantity problems. In fact, Puerto Rico considers providing high quality water the Commonwealth's highest environmental priority. In the Virgin Islands, residents and tourists must rely on a variety of water sources and treatment techniques to meet their consumption needs. For more information about drinking water issues and how they are being addressed in Puerto Rico and the U.S. Virgin Islands, see *The Unique Caribbean Environment* Chapter.

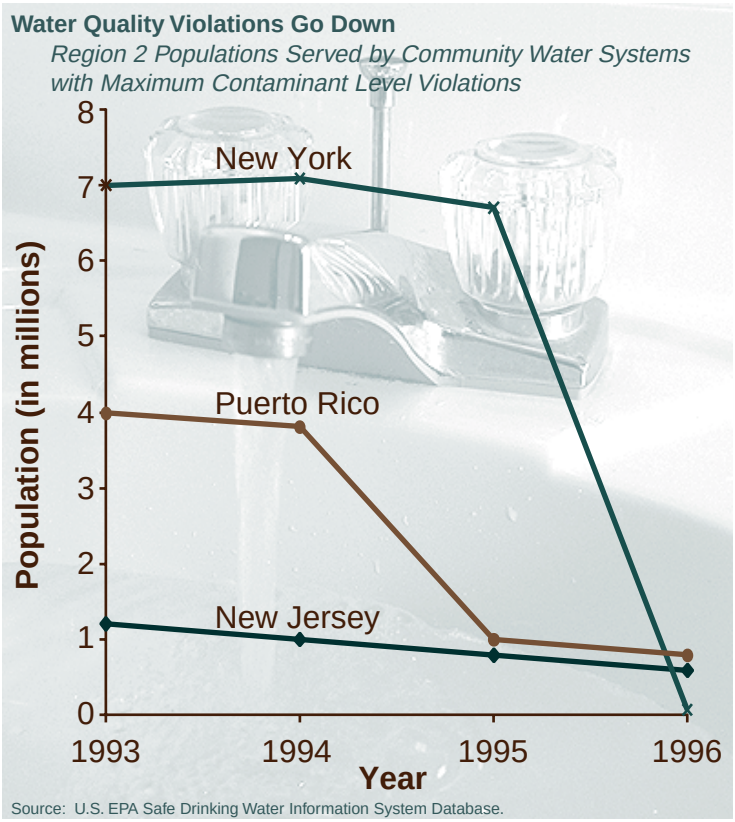


Figure 12

Protecting New York City's Drinking Water Supply

The nine million residents of New York City and parts of Westchester County use between 1.2 and 1.3 billion gallons of water a day. With no feasible source of clean drinking water nearby, the city relies on water piped in from a series of reservoirs in the Croton, Catskill and Delaware watersheds, located just north of the city and in upstate New York. The land area (often referred to as a watershed) draining into the reservoirs covers approximately 2,000 square miles.

EPA requires filtration of water supplies to protect against contamination by microbes such as Giardia and Cryptosporidium. A water supplier can receive a waiver from filtration when it can be demonstrated that the water supply does not contain these pathogens, stringent watershed protection measures are in place and that the water supplier can control human activity in the watershed.

To protect the Croton system, which supplies 10 percent of New York City's drinking water, the city will build a filtration plant by 2006, and take additional steps to reduce contaminated runoff in the watershed. In the case of the Catskill and Delaware systems, a plan has been developed to ensure clean, safe drinking water without spending between 4 and 6 billion dollars on a filtration plant. In 1993, EPA issued the city a waiver of the filtration requirement for these two systems on the condition that the city take steps to maintain and protect the watershed.

Working as part of a team including New York City, New York State, local watershed communities and counties, and a coalition of environmentalists, EPA helped develop a plan outlining measures to protect the upstate watersheds draining into the Catskill and Delaware reservoirs. The plan regulates land-use in sensitive areas, calls for acquiring particularly sensitive land, outlines water quality testing procedures, and supports upstate/downstate partnership programs. These actions have enabled New York City to continue protecting its drinking water by preventing pollution at the source in these two watersheds instead of building an expensive filtration plant.

Things You Can Do

- Avoid over-watering your lawn or garden.
- Avoid using toxic materials on your lawn.
- Do not run your dishwasher or washing machine half-full
- Do not pour household chemicals or used motor oil down drains or sewers
- Use low-phosphate or phosphate-free detergents.
- Have your septic system inspected annually.
- Repair plumbing leaks.
- Turn faucets off when shaving or brushing your teeth.
- Avoid littering; litter clogs storm drains, sewers and waterways.

For More Information

Water Resources Center Hotline: 202-260-7786

Safe Drinking Water Hotline: 800-426-4791

Internet Home Page for EPA's Office of Water: http://www.epa.gov/owow